DOCUMENT RESUME

ED 236 000 SE 043 170

AUTHOR	Neustadtl, Sara Jane
TITLE	Women Engineer.
INSTITUTION	National Executive Committee for Guidance, New York, NY.
SPONS AGENCY	Du Pont Corp., Wilmington, Del.
PUB DATE	74
NOTE	21p.
AVAILABLE FROM	Society of Women Engineers, 345 East 47th Street, New York, NY 10017 ($1.00).
PUB TYPE	Guides - General (050)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Employment Opportunities; *Engineering; *Engineering Education; *Engineers; *Females; *Science Careers; Science Education; Secondary Education; *Secondary School Science

ABSTRACT

This booklet is designed to provide information to girls about the nature of and possible career opportunities in engineering. Following a brief introduction in which the characteristics of engineers are outlined (such as ability to solve problems, interest in science/mathematics, and urge to make creative use of their intelligence), answers to five questions are provided in subsequent sections. These questions are: What is engineering? What kind of girl becomes an engineer? What is it like to be a student in engineering? How do you enter a college of engineering? and What's it like to be a woman engineer? Answers to the questions are accompanied by statements of female students, practicing engineers, and faculty, and by black and white photographs and line drawings. (JN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED236000

WOMEN
WOMEN
WOMEN
WOMEN
WOMEN
WOMEN

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

SE043170

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
M.H. Lehtinen

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ENGINEER
ENGINEER

Reprinted with the permission of the College of Engineering, University of Illinois at Urbana-Champaign

Written by
Sara Jane Neustadtl

Designed by
William May

Published by
NATIONAL EXECUTIVE COMMITTEE
FOR GUIDANCE
345 East 47th Street
New York, New York 10017

3

EC-72(4), 6/82, 25M © Copyright 1974. Engineers' Council for Professional Development

FIRST,

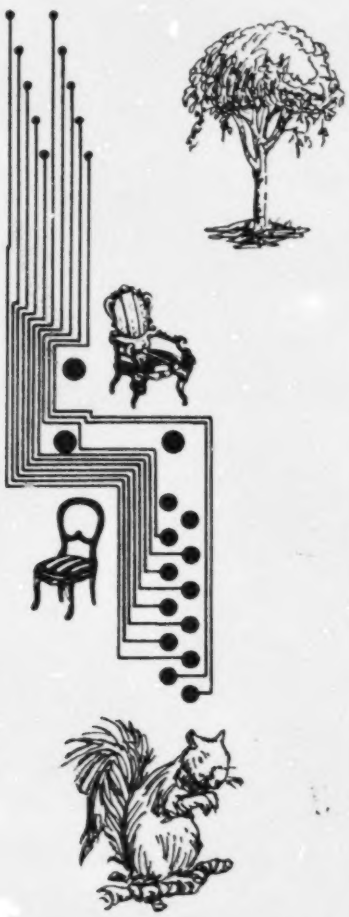
let's get one thing straight.

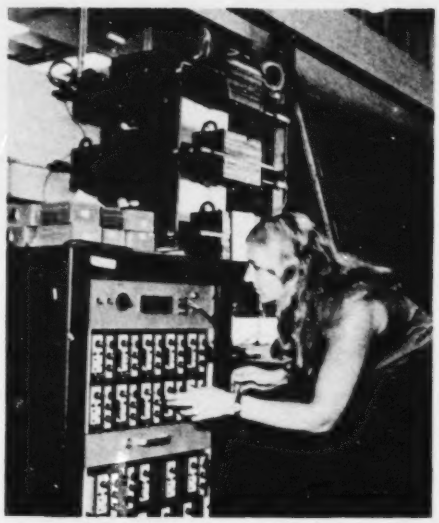
Engineering isn't intrinsically masculine, any more than cooking is intrinsically feminine.

Computer design is no more masculine than interior design is feminine.

Environmental engineering is no more intrinsically masculine than love of beauty and nature is intrinsically feminine.

Get the picture?

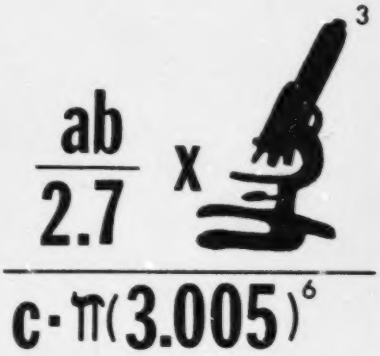




Yes. Engineering is a male-dominated field. That doesn't mean that the work of engineering can't be done (or even done better) by females. The characteristics engineers have in common are an ability to solve problems, an interest in math and science, and an urge to make creative use of their intelligence.

Now, are those all masculine characteristics?

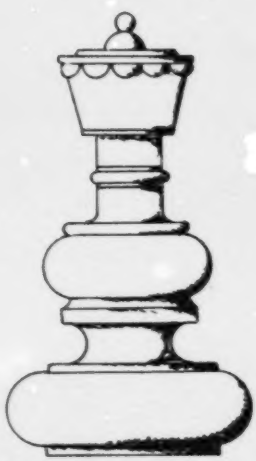
One of the barriers preventing women from entering engineering is that society expects them to avoid responsibility, to underrate their ability, and to shrink from competition. If you have an interest in math, science, and problem solving, and the independence of mind to ignore society's pressures, then you can have a rewarding place in the engineering profession.



In engineering, what matters is ability. Solutions to engineering problems are judged by their practicality, not by personality or prejudice. The answers either work, or they don't. So, in this male-dominated field, if a woman can do the work, and do it well, she will be accepted and respected for it. It's ability that counts.

And that's important, if you think about it.

College is a preparation for a lifetime career. A career that is challenging, expressive, and stimulating is bound to be satisfying. Engineering can satisfy your desires for self-fulfillment, and give you the opportunity to do meaningful work for your fellow man and woman. It's a chance to make a difference, working through technology. As a woman as well as a human being that probably matters to you.



"Most of the men, when given a week or so, realize that I am an engineer who just happens to be a woman."

"One can't deny that there are very few women engineers today, but one should not infer from their scarcity that those few are poorly treated."

"I would urge any girl who feels that engineering is her field to stick with it and not be discouraged."

"I have found that engineering managers who interview women for engineering positions seem quite capable of recognizing that the basic question is, 'Can she think?' "

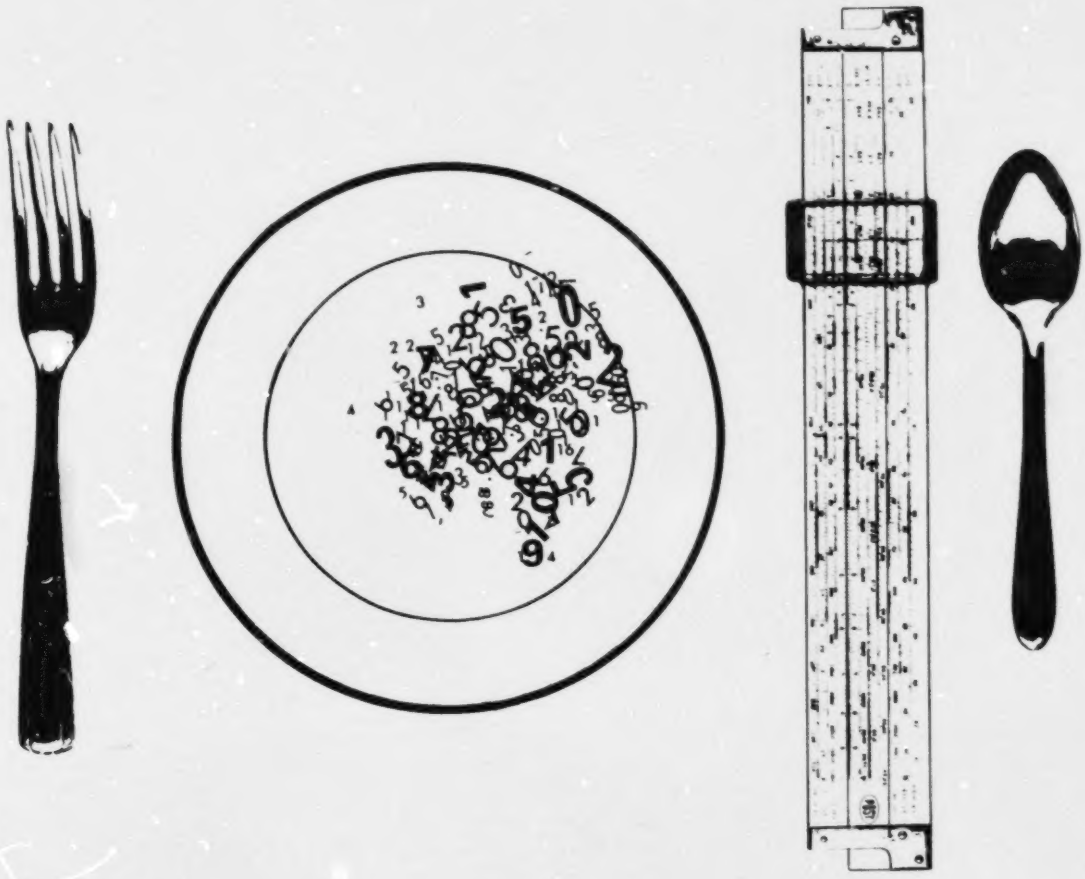
"My work in engineering is still something I enjoy. I guess the best thing about it is adding to what I have learned and seeing it put to use."

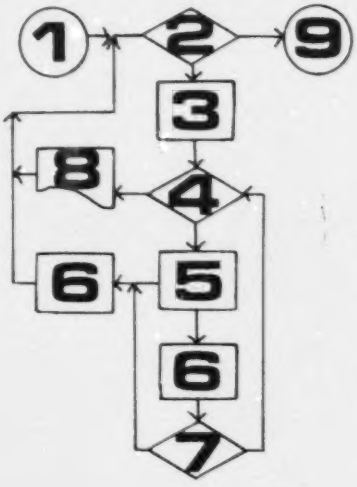
WHAT IS ENGINEERING?

Engineering, any type of engineering, is simply the art of finding "practical solutions to human problems." Engineering problems are found anywhere there is human activity. Finding ways to disperse automotive and industrial waste without damaging the natural cycle of the earth is an engineering problem. Finding ways to produce and store food in abundance to feed the three and a half billion and still growing population of the world is an engineering problem. Even designing new kinds of prisons that work to reform rather than to punish is an engineering problem.

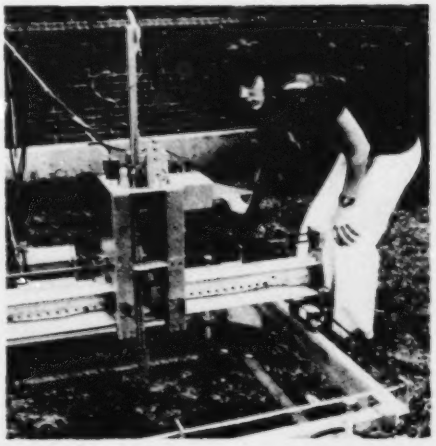
Engineers are a part of the awakening movement to balance the advances of technology with the needs of the material and social environment we live in. By being an engineer, you won't save the world all by yourself. Maybe you won't even come close. But you will be doing work that is useful, constructive, and that challenges you. And you will be working with a group that is able, more than any other, to reclaim wasted land, clean the air, and make the world a better place to live in.

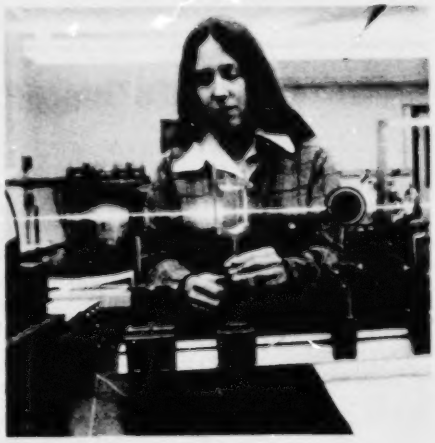
Now you probably want to know exactly what an engineer does, and how she goes about finding all these useful solutions. She does it with simple tools: a knowledge of mathematics, of the natural sciences, and her own ingenuity.





If you were to solve an engineering problem, you would first study the nature and size of the problem, and break it down into a series of smaller parts (analysis). Some of the parts will be technical problems, some will be problems of people, and almost always there will be the problem of cost. You would spend a lot of time thinking over the problem at this point and weighing the various factors to decide which would be most important to your solution. You would discard the unimportant ones and gather more information on those more relevant to the problem (evaluation). During this stage, you would use all the knowledge you have gained from experience, observation, reading, and your own or others' research. After you reach a solution to each part of your project, you would bring all the partial solutions together to see if they add up to a practical solution (synthesis). The final step is to start over again, to see if there isn't a better way.





"At first my co-workers were not confident that a woman could fill my position. After seeing my work and showing them short cuts in their own work, I have won them over as a boss and a woman."

"To be a professional is a challenge to a woman, but she should meet it as a challenge, be fair, and learn from it."

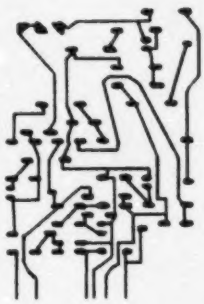
"My own impression is that women are far better accepted as engineers than in other industrial jobs such as planning, purchasing, finance, or shop scheduling. My explanation of this is that engineers really are rational people and therefore can accept the fact that their job can be done by a woman."

"Since I work for a small company, my duties are varied. Mainly I perform stress analysis and gearing and shafting design. I also write computer programs for all the engineers and help out if someone has a math problem."

WHAT KIND OF GIRL BECOMES AN ENGINEER?

Charmaine's older brother has a degree in electrical engineering. So, when it was time for her to decide what to do after high school, she had a direct source of information and encouragement. She hadn't missed a space shot since she was in grade school, and was fascinated by astronomy, so she found it an easy decision to choose engineering physics as her major.

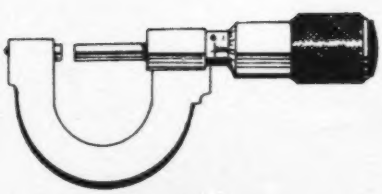
Not all girls are that lucky. Pam, coming from a small town, had to fight disbelief and discouragement from friends and high school counselors as she made plans to go to college. Even her parents had a hard time adjusting to the idea. She was forced to examine herself, her abilities and interests, and make certain that engineering was the best choice for her. She is now working on a doctorate, and plans to teach engineering and work at helping girls in situations like hers.

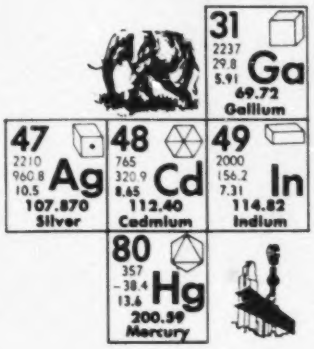


Carol entered engineering as an alternative to being a math teacher. She chose computer engineering because of her interest in mathematics, not because she saw herself as a rebel or a crusader. She also knew that, while the teaching profession is becoming overcrowded, the field of computer engineering is growing, and her skills will be in high demand.

Andrea, like the others, enjoyed math and science, and wanted to apply herself to positive action in the environmental cause. She felt she could do more in engineering than she could by carrying around a poster.

Eileen, who graduated from college twenty years ago, returned to night school after marrying and raising a family to get a degree in industrial engineering. Eileen was dissatisfied with her job, and wanted a new career that would give her a chance to use her full potential.



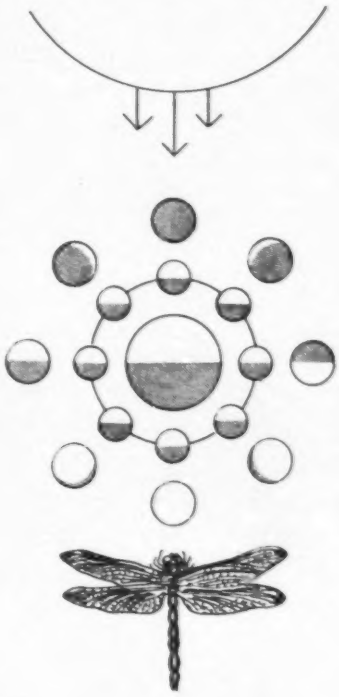


You see you can't classify them by personality, or by looks, or even by motivation. They are alike in their general scholastic interests, in their high ability, and in the extent of their commitment. As for the rest of their characteristics, these women are themselves.

Your motivations for entering engineering will be your own. Perhaps some of the girls described above are like you; perhaps you have your own reasons.

11

Either way, a word of caution is necessary. The field of engineering is, as mentioned before, a world of men. In many places women are viewed with doubt and reservation. You could be fighting a double battle after graduation. Proving yourself as an engineer will be harder for you than it will be for the men you will be working with. But your success will help future women engineers to have an easier time entering your profession.

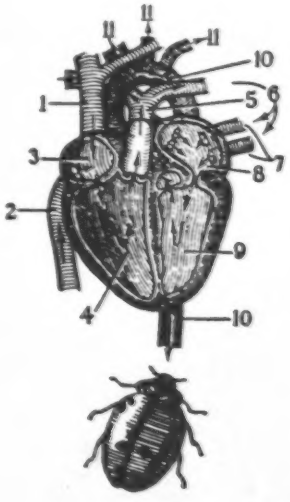


"Any young woman entering engineering must remember that she is going to face many frustrating situations which she can do nothing about when dealing with older male engineers."

"I've encountered prejudice and spent much time proving myself technically competent, but have not experienced any really open prejudice. Many male engineers seem to accept me as an engineer, but wouldn't want their daughter to be one."

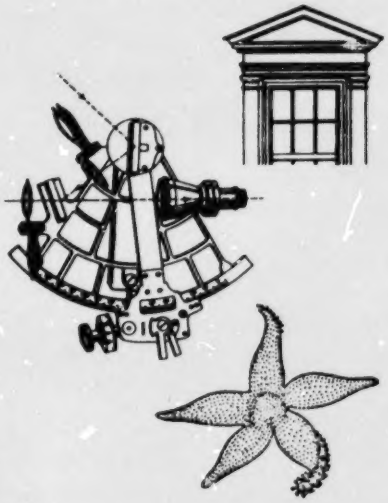
"My husband is a registered civil engineer. He is very much in favor of my continuing in my profession and has stimulated my incentive during rough periods. We also have a three year old son that is prospering by my working."

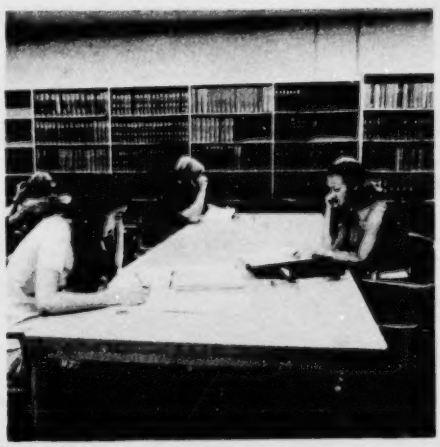
"During the course of a week, I find that I have many roles to fill — wife, mother, engineer, student, and teacher. Because of the nature of things, I find that it is impossible to entirely separate any of these roles from my individuality."



WHAT'S IT LIKE TO BE A STUDENT IN ENGINEERING?

The first thing to mention is that things have loosened up. Although in some classes you may be the only girl, you will probably not encounter prejudice on the part of professors and fellow students. In fact, they will be glad to have you there.





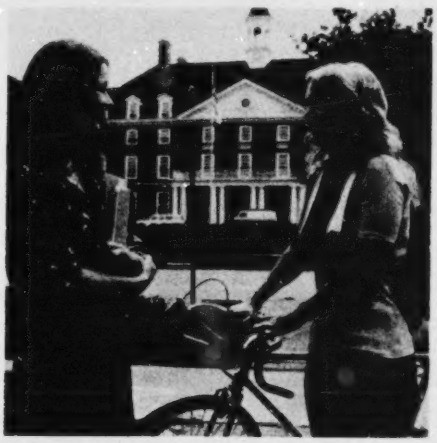
The classwork in engineering requires more effort than other majors, so expect to spend a lot of time studying. Don't expect to have to be better because you're a woman. Studies have shown that men and women of equal ability do equally well in engineering school. If you *are* better, that's another point in your favor.

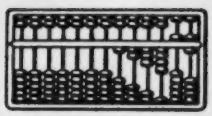
As an engineering student, you will spend more time in problem solving than in outside reading. Many of your assignments will require extensive use of slide rules, computers, and the techniques of higher mathematics. Laboratory courses will provide you with real engineering experience; in most engineering curricula you will be taking one or more each semester. With all this activity, it's easy to see that keeping up with your engineering studies is very important.

All things considered, being a woman in the college of engineering is just like being a woman in any college. You will date and party, talk and study. And unlike many women who will graduate with you, you will have the satisfaction and security of a professional career to look forward to after graduation.

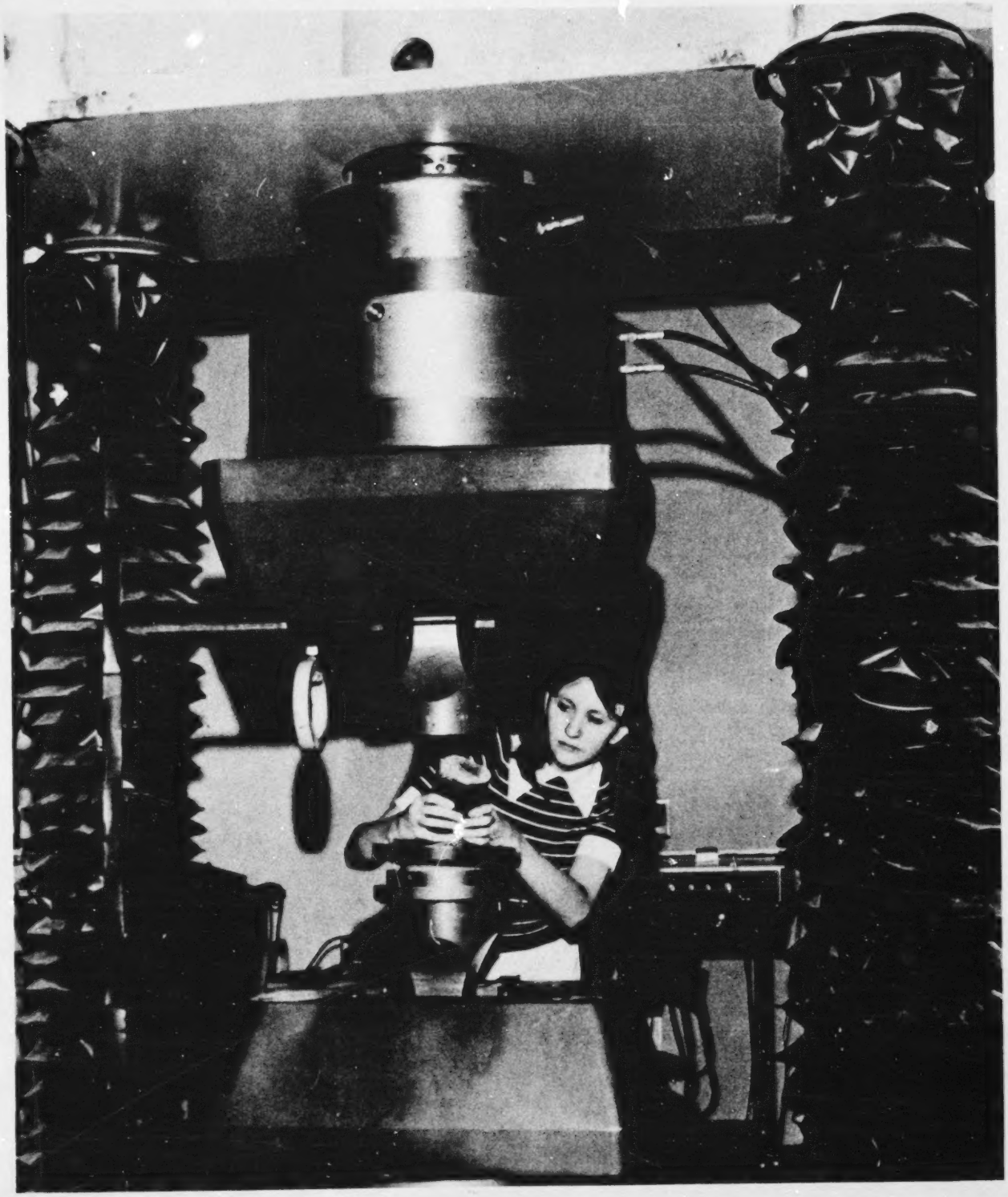
You needn't decide right away which field interests you most. Freshmen and sophomore programs are designed to give the undecided engineering student a taste of most fields, to help to make your decision in specialization easier by the sophomore or junior year. Some colleges offer work-study programs, in which the student works in periods alternating with studying on campus. This is a good way to gain direct experience while in school, and also to earn money. Another alternative is a five-year program which gives you a double degree in engineering and liberal arts. This is good preparation for an interdisciplinary career, such as bioengineering; for graduate study in subjects such as medicine or patent law; or simply for a broader background in the social sciences and humanities.

The woman entering engineering also has the advantage of closeness with her fellow woman engineers. Because women in engineering are still unique, they have organized into groups of mutual help and friendship, such as local chapters of the Society of Women Engineers.





If you major in engineering, you have a choice of specialties which includes aeronautical, agricultural, ceramic, chemical, civil, computer, electrical, industrial, mechanical, metallurgical, and nuclear engineering, engineering mechanics, or engineering physics. Statistically, women tend to choose electrical, computer, industrial, and mechanical engineering most often. But now even male strongholds like civil engineering are expanding their opportunities for women.

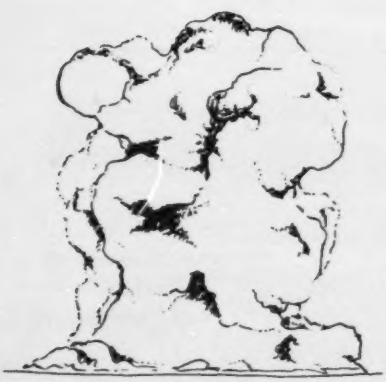


"When I entered engineering, I was most unsure of myself. I didn't know if I would really like it or if it would work out as a career. When it did, I found that I then became more skeptical of some of the other 'supposed to's' of life. I'm sure I'm a happier person because my choices are really my own."

"In general, I was accepted very well in school. I did the best I could when starting on a new class project and most of the guys accepted me as a part of the group in a very short time."

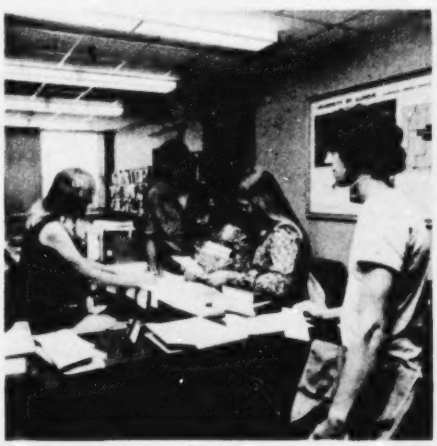
"During my four years in college, I received the same treatment from faculty and administrators as the men. I also found that the people are very kind and friendly and will go out of their way to help you. My college years were more satisfying and rewarding than I had thought possible when I first started."

"My freshman year was the most difficult in college, especially classes like drafting where I was the only girl."



HOW DO YOU ENTER A COLLEGE OF ENGINEERING?

The entrance requirements of most better engineering colleges are quite similar. You should be in the upper quarter of your high school graduating class and have good ACT or SAT scores. Your high school program should include a strong background in English, math, and science. Chemistry, physics, trigonometry, calculus, and two years of a foreign language are also highly desirable. With qualifications such as these, you should have no trouble being accepted at most schools of engineering.

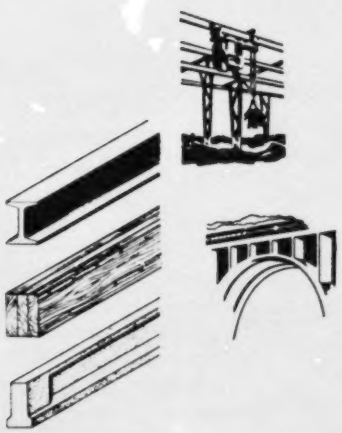


In addition, you must want to succeed. You must be willing to work harder than many of the other students you will see around you. You must realize that your field of study will give you less free time than some others. A natural flair for problem solving will help you along, but in this as in any other curriculum, you will only get from it as much as you put in.

WHAT'S IT LIKE TO BE A WOMAN ENGINEER?

After all, this is what it's all about, isn't it?

Women engineers work in many fields in many capacities. They are managers, analysts, and even construction bosses. They work in new product design, materials testing, and research. Some have branched out, and are working at technical writing, teaching, for consulting firms, or working part time while they concentrate on home and children.



They find that the best part of their job comes in the mental stimulation and constant feeling of learning put to use that is involved. Another consideration, and not a minor one, is the higher salaries the engineering profession offers, even at the B.S. level. And these women enjoy their status as professionals. They feel that their work is wanted, needed, and used for greater benefit of society.

Women just entering engineering are finding that their minority status is making it easier for them to find that initial first job. Even when this situation, however convenient, is remedied, the fact still remains that in the near future the demand for engineers will increase more quickly than the supply. Woman or no, engineers will find jobs.

Take it from one woman who is a working engineer. "My only advice to girls is, if they like math and science, and they want to apply it to everyday life problems, then they should enter engineering, be stubborn, and not let anyone try to talk them out of it. All the time I was in school I kept trying to figure out other things I might be doing. But after I got into engineering, I never had any further doubts. This was IT."

"Once I was returning a call to a man, and when I identified myself the secretary said, 'Oh, you're a girl.' "

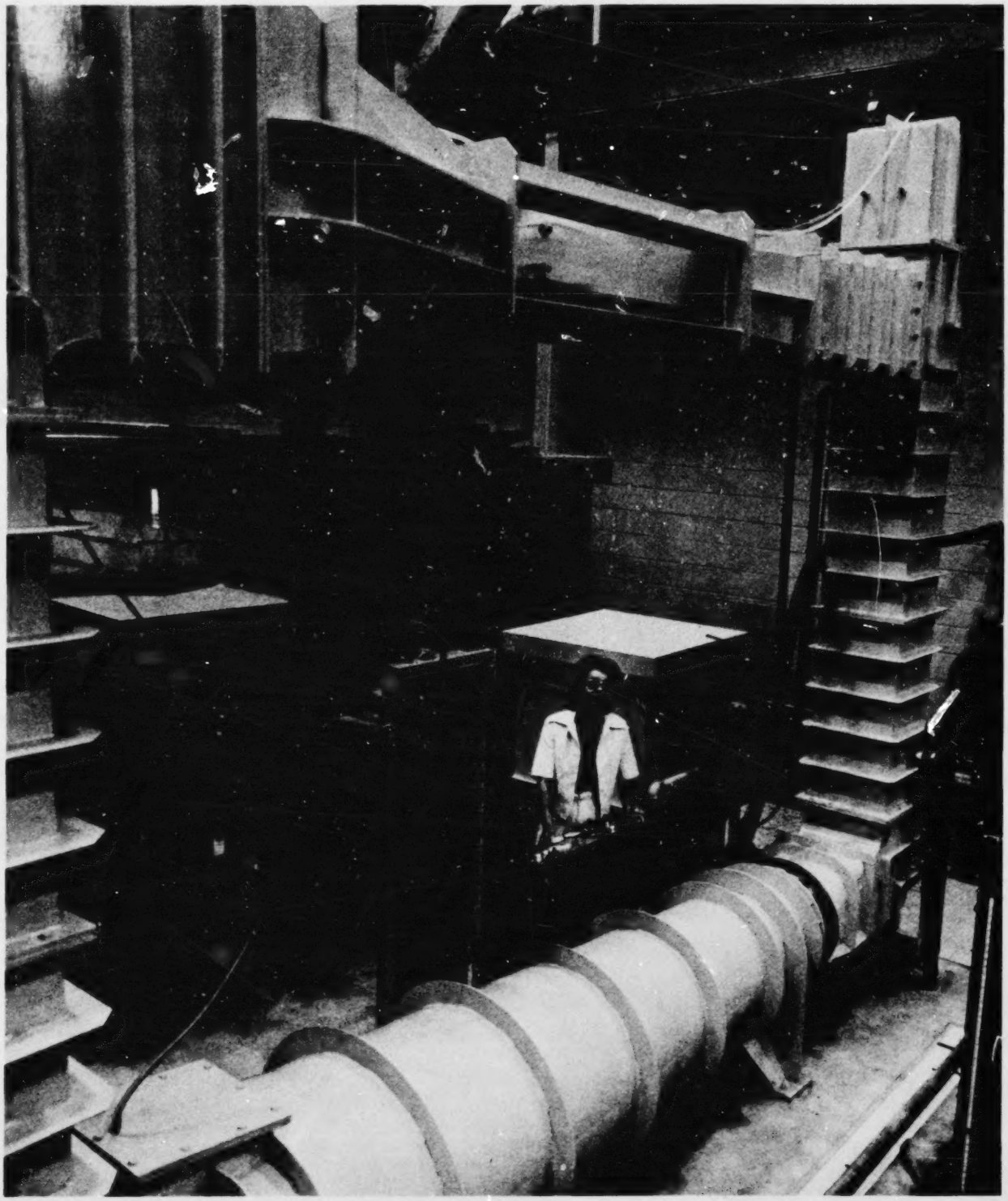
"Regardless of the many problems, I've loved every minute of it and never want to leave it. It's still the best life's work I could have chosen."

"I think industry has awakened to the fact that a woman can work effectively in the engineering world."

"When I got married I informed the professional organizations I belong to that I was changing my name. One sent back a reply that they needed a 'court order' proof that I legally had changed my name. As I am probably the only female member, it never occurred to them that I got married."

"My previous engineering jobs in design or system integration have been on products such as weather satellites, jet engines, and nuclear reactors. This succession of different, responsible jobs has meant a career that never gets stale."

"When we talk of having children and responsibilities, the men feel that my place would be in the home and not doing engineering work. I feel differently."



18

The thoughts and opinions quoted here, and on which this booklet is based, are not fictional. A number of women — students, practicing engineers, and faculty — have contributed their comments and suggestions to this booklet. Among the many who helped are:

Betty Lou Bailey	Systems Design Engineer; General Electric
Emma Barth	Technical Writer; Westinghouse
Carol Bauer	Co-op Trainee Engineer; NASA
Lynn Grazon	Program Engineer; General Electric
Claire Heisse	Industrial Engineer; Conco
Sandra Levey	Sanitary Engineer; Jenkins, Merchant, and Nankivil
Kay McDaniel	Engineering Writer-Editor; Martin Marietta
Elizabeth Mitofsky	Mechanical Engineer; Bodine Electric
Marlene Tottenhoff	Design Engineer; Campbell Soup
Pam Van Blaricum	Graduate Student; Aeronautical Engineering
Grace Wilson	Professor Emeritus of General Engineering
Charmaine Wisniewski	Undergraduate Student; Engineering Physics
Eileen Woods	Mechanical Engineer; General Services Administration
Carol Woodyard	Undergraduate Student; Civil Engineering
Mary Ann Zimmerman	Traffic Engineer; City of Chicago

NATIONAL EXECUTIVE COMMITTEE FOR GUIDANCE
c/o ABET, 345 East 47th Street, New York, NY 10017

The National Executive Committee for Guidance is composed of the guidance chairmen of the Accreditation Board for Engineering and Technology, American Society for Engineering Education, the National Society of Professional Engineers, plus a representative of the Junior Engineering Technical Society. ABET is a federation of the engineering societies listed below. Information of specialized disciplines may be obtained directly from the *Guidance Department* of these organizations.

American Academy of Environmental Engineers
Box 1278, Rockville, MD 20850

American Congress on Surveying and Mapping
210 Little Falls Street, Falls Church, VA 22046

American Institute of Aeronautics and Astronautics, Inc.
1290 Avenue of the Americas, New York, NY 10019

American Institute of Chemical Engineers
345 East 47th Street, New York, NY 10017

American Institute of Industrial Engineers, Inc.
25 Technology Park/Atlanta, Norcross, GA 30071

American Institute of Mining, Metallurgical and Petroleum Engineers
345 East 47th Street, New York, NY 10017

American Nuclear Society
555 North Kensington Ave., La Grange Park, IL 60525

The American Society of Agricultural Engineers
2950 Niles Road, St. Joseph, MI 49085

American Society of Civil Engineers
345 East 47th Street, New York, NY 10017

American Society for Engineering Education
One Dupont Circle, Washington, DC 20036

American Society for Metals
Metals Park, OH 44073

American Society of Heating, Refrigerating and Air Conditioning Engineers
345 East 47th Street, New York, NY 10017

The American Society of Mechanical Engineers
345 East 47th Street, New York, NY 10017

The Institute of Electrical and Electronics Engineers, Inc.
345 East 47th Street, New York, NY 10017

National Council of Engineering Examiners
Box 5000, Seneca, SC 29678

National Institute of Ceramic Engineers
65 Ceramic Drive, Columbus, OH 43214

National Society of Professional Engineers
2029 K Street, N.W., Washington, DC 20006

Society of Automotive Engineers
400 Commonwealth Drive, Warrendale, PA 15096

Society of Manufacturing Engineers
One SME Drive, Box 930, Dearborn, MI 48128

Society of Naval Architects and Marine Engineers
One World Trade Center, New York, NY 10048

A WORD ABOUT WOMEN ENGINEERS

The Society of Women Engineers, 345 East 47th Street, New York, NY 10017, is the professional engineering organization dealing with women.

Publication and distribution of this booklet was made possible by a grant from E. I. du Pont de Nemours & Company.

For further information, contact:
National Executive Committee for Guidance
c/o ABET
345 East 47th Street
New York, New York 10017